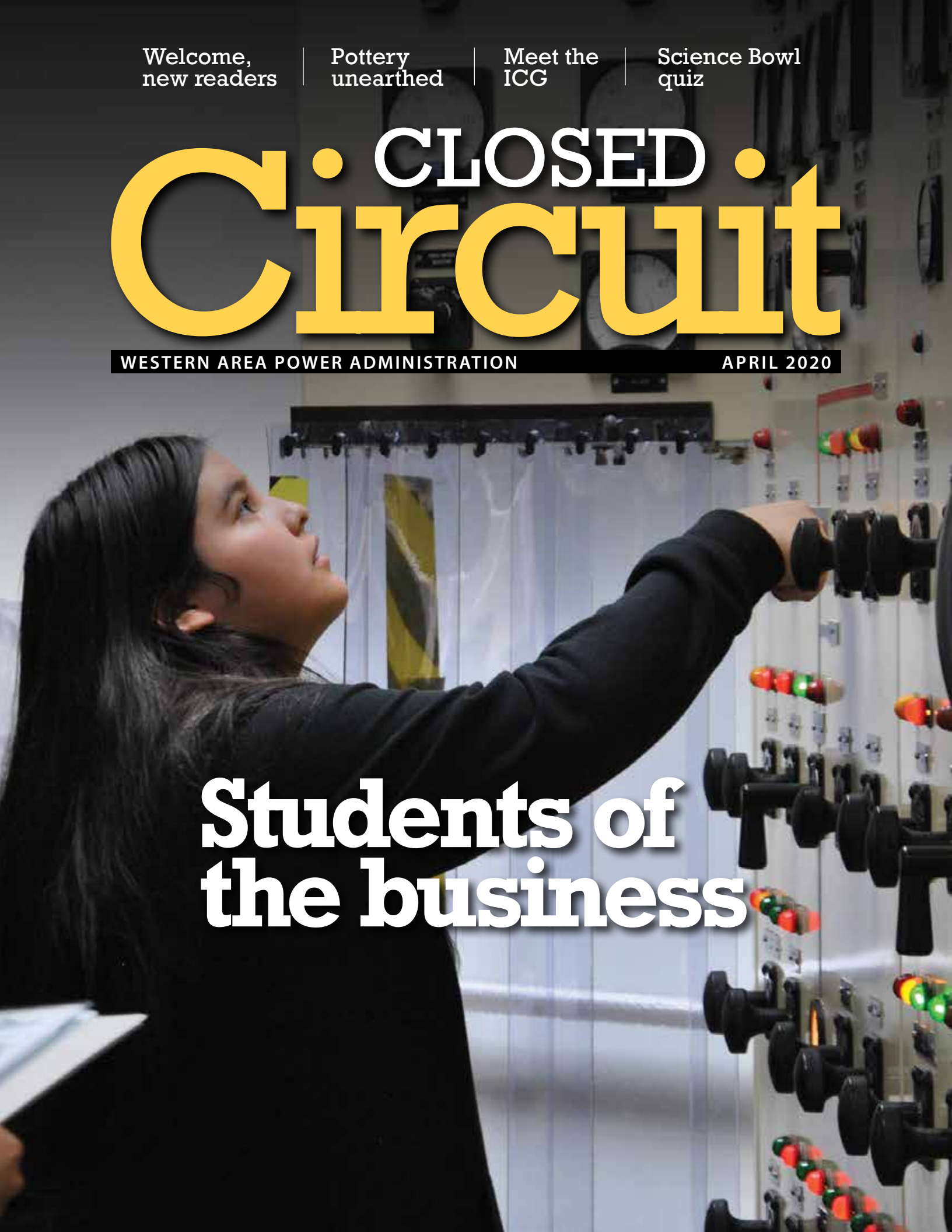
Welcome, new readers | Pottery unearthed | Meet the ICG | Science Bowl quiz

CLOSED Circuit

WESTERN AREA POWER ADMINISTRATION APRIL 2020



Students of the business

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*In late February, students from John F. Kennedy High School in Denver, Colorado, visited WAPA's Electric Power Training Center. Read about their visit on Page 10. (Photo by **Leah Wilson**)*

CLOSED Circuit

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Editor: PHILIP REED

Graphic Designer: GRANT KUHN

Do you have an idea for a story?
Contact **reed@wapa.gov**

Western Area Power Administration

WESTERN AREA POWER ADMINISTRATION
P.O. Box 281213
Lakewood, CO 80228-8213
720.962.7050
www.wapa.gov | publicaffairs@wapa.gov

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Three little words

By Philip Reed

You might have noticed three words missing from the cover of this month's *Closed Circuit*: "Published for employees." Their removal represents one more step forward in WAPA's commitment to transparency.

In 2015, WAPA's Office of Public Affairs launched customer bulletins, which then became *Customer Circuit*, a publication designed to keep customers abreast of what was happening in and around WAPA. *Customer Circuit* was released quarterly and did a great job of communicating important updates.

Of course, a great job isn't always the best possible job, and one of the organization's core values directs employees to "do better." The removal of those three words on the cover of *Closed Circuit* represents one way in which we are doing just that.

Starting with this very issue, *Closed Circuit*—WAPA's monthly internal magazine—will be distributed to customers as well.

This will serve several purposes. Most obviously, it will mean Public Affairs is producing one regular publication instead of two, which increases efficiency for the department. It also means that customers will receive the same stories employees receive, at the same time, further increasing organizational transparency.

In addition, this will keep customers even more aware of WAPA's happenings, as issues of *Customer Circuit* were often around 12 pages and released each quarter. *Closed Circuit*, by contrast, is often around 20 and released each month. By replacing *Customer Circuit* with *Closed Circuit*, customers will receive more information more frequently.

Historically, *Customer Circuit* would contain a large amount of the same information shared in *Closed Circuit*. The layout would be different, the stories might be truncated for space and other edits may have been made narratively to reflect the change in audience. Now, the same stories will be told the same way across both audiences.

One thing that will not be changing is the State of WAPA's Assets. This was the name given to the winter issue of *Customer Circuit*. This publication was unique in the sense that it focused on specific projects and initiatives each region and Headquarters would be focusing on for the rest of the calendar year. The State of WAPA's Assets served an important and valuable function, and it will therefore continue without interruption.

As readers—old and new—might imagine, an initiative such as this one is bound to be more complicated than it at first seems. For that reason, the magazine may continue to adapt and improve. Reader feedback is important, so do not hesitate to share your thoughts.

In the meantime, though, the removal of three little words signifies a large step forward for the organization's communication efforts. We welcome our new readers, and we hope you enjoy receiving *Closed Circuit*. □

Note: Reed is a public affairs specialist and the editor of Closed Circuit.

Contact **reed@wapa.gov** if you have any questions or feedback regarding this change.

Crews, maintenance managers and engineers came together to address foundation issues in a project that was three years in the making.

North Fork-to-Rifle structure repair underway

By Leah Wilson
Photos by Charles Garcia

In June 2018, engineers **Charles Garcia** and **Cody Neyens** examined several steel-lattice structures on the 230-kilovolt transmission line between the North Fork and Rifle substations. They were there to address potential issues that were previously noticed during line patrols; a few tower foundations were damaged due to soil movement and drainage problems. This caused the foundations to slide and the structures to twist.

"Work was scheduled to replace insulators and other line hardware, as well as replacing bent steel members and improving drainage around two structures, in the summer of 2019," said Supervisory Electrical Engineer **Jason Groendyk**.

At the same time, fiscal year 2020 budgeting and planning were taking place for permanent repairs and possible structure replacements in the future.

Options and solutions

Several recommendations were made to address the immediate problems. These included replacing the bent legs, monitoring future movement and improving drainage around the structures.

Additionally, two long-term repair options were presented. The first option was to dig up the foundations one at a time and move them into the correct locations, then backfill and slope the soil for drainage away from the foundations. The second option was to replace the structure with a deep-foundation steel pole. After careful consideration, it was decided to go the first route.

"About 25 years ago when I was an apprentice, Montrose crews did this procedure before," said Foreman II Lineman **Craig Geesing**. He explained that this fix had held up since, making it a viable option for future repairs instead of replacements.

"I was more involved in developing a future project to repair and replace these structures, and was informed [by HQ's engineers] that the 'temporary' repair was actually going to hold up as a permanent repair," Groendyk said.

Slip slidin' away

There could be multiple reasons a foundation slides.

"Historically, it's been an issue," said Geesing. "There have been towers that have moved and changed in the past."

"On mountains, some areas have weaker layers of soil. When saturated by water, areas can slip," Garcia said. "It could be a tree clearing, road or drainage construction, a natural phenomenon or bad winters where there is more snow in the area than normal."

Ultimately, there could be any number of causes spanning any amount of time.

"It depends on the situation," said Garcia. "It could happen in a single storm or over the course of decades."

Fixing it

There were many hands essential to the North Fork-to-Rifle restoration. Crews from Montrose, Shiprock, Craig and Cheyenne came together to participate in the project, as well as foremen, maintenance managers and civil engineers from Rocky Mountain and Headquarters.

The structure repair process is extensive.

"First you unhook the insulators from the conductors on the suspension structures and plumb them vertical," Garcia said. "This balances out the loading and makes the loads vertical to the structure. You do this to each of the three insulators that are attached to the conductors, and the optical ground wires if needed."

Geesing explained that after the replumbing, the crews monitor how the ground wires are moving. A crane is then attached to the tower leg to remove all load from the tower to the foundation. The load is calculated each time per structure. Then, once the tower is secure, a backhoe is used to dig down and around to the base of the foundation.

continued on Page 4

Top: Insulators being out of plumb were some of the issues crews needed to address. According to Garcia, "It doesn't take much to change the tensions in the wires and put loads in the tower."

Far right: Shifting foundations can result in many issues for towers, such as the bowing visible in this photo.

Right: This 15-degree base adaptor was one way crews were able to address the problem.

"The foundation will then be moved to the correct location to remove all bending and stresses in the members," Garcia said. "I had to be there to address anything that came up since I design these structures."

Once the foundation is in the correct position and the tower is straight, a backhoe is used to begin filling in and around the foundation. Finally, the crane can release the load from the tower.

With a project this extensive, a few unexpected obstacles were encountered. It wasn't for lack of planning, however; often the extent of the work doesn't fully reveal itself ahead of time. Garcia explained that sometimes they won't even know what they're up against until they start to move a structure.

For instance, during this project, a lot of rock was encountered, making it difficult to balance towers out and drill through and repair some of the structures. Another issue was difficulty driving to the towers. Many times, the crews had to improve the access roads by taking out trees and building safer turns for the large trucks that were necessary for the repairs.

In addition, water posed a threat to moving foundations; one tower was holding water due to an incorrectly installed drain.

Through perseverance, crews were able to complete a few of the tower repairs and save customers money in the process, as replacing structures with steel poles rather than repairing the existing structures would have been costly.

"It would be about $500,000 per structure," Garcia noted. "Also, a steel pole replacement would take about six months to fabricate and deliver. A contract would have to be bid and a construction contractor selected to install the pole and foundation. This would include widening and making the access roads better for a large crane to set the pole and drill the large deep foundation."

"Ground patrol is once a year and flown twice a year to monitor what they've done and what the status is," Geesing explained. "It's an ongoing process, but it saved them quite a bit of money as opposed to replacing or moving them."

Overall, WAPA's maintenance crews avoided $2.25 million in cost with this repair work.

Not done yet

"We dug up and moved the footers on two of them, the worst ones," said Geesing. "We plumbed the insulators and put the links in the statics on quite a few. Fourteen more were identified as having bent steel. This August we will work on some more to get them straight and replace any bent steel."

"There were structures that required foundation adjustments," Garcia added. "We did three structures and the other two will be completed this summer. The schedule was dictated by the crew's availability to do the work."

The structures will continue to be observed for movement. Monitoring and repairing potentially damaged towers will be a yearly task for the next five to eight years. □

Note: Wilson is an administrative analyst who works under the Wyandotte Services contract.

Inaugural ICG participants selected

In early March, Chief Public Affairs Officer **Teresa Waugh** announced the selection of the first participants of WAPA's new Integrated Communications Group.

Guided by *Strategic Roadmap 2024* and the critical pathway of Mutually Beneficial Partnerships, the ICG targets gaps in communication by bringing together a diverse team of employees to identify needs and disseminate messaging to improve communication in hard-to-reach areas of the organization.

The ICG is headed up by Waugh and Senior Vice President and Colorado River Storage Project Manager **Steven Johnson**.

The 2020-2022 group of participants includes individuals from different backgrounds, regions, functions, groups and grade levels, ensuring that all necessary parties are collaborating and bringing forward well-thought-out strategies with a bias toward action.

The ICG was founded with an understanding of the critical need for aligned messaging.

"Stakeholders may hear two different messages, or many different ones for that matter, and that breaks trust," said Waugh. "People want and need to know that everyone in an organization is on the same page."

Waugh emphasized that the importance of aligned messaging cannot be overstated, and that customers have different expectations than they had in the past.

"Live, modern media is coming at us from every direction," she explained. "Countless social media channels create stakeholder-led media, and we are in the stage of rapid understanding. This poses challenges in a rapidly changing environment such as energy."

Closed Circuit reached out to the first batch of participants to get their thoughts on WAPA's innovative solution to communication complications.

Administrative Officer Michelle Fink

I'm honored to be selected for the Integrated Communications Group. I applaud WAPA for recognizing the value of effective communication and for the efforts to continuously develop in this area. I look forward to collaborating with the other members of the ICG as we "Seek. Share. Partner." to help improve communication.

Transmission and Power Markets Advisor Rebecca Johnson

Communications that are aligned and cohesive yet tailored to diverse audiences will be critical for organizational alignment and stakeholder buy-in on strategic initiatives. I welcome the opportunity to help to shape those communications and am pleased to have been selected for the team.

Emergency Management Specialist Tarra Keathley

If an organization is accustomed to aligning communication on a daily basis, emergency communication will be much more effective. I look forward to being a part of the ICG, which will help ensure lines of communication are available to all WAPA employees during both normal operations and emergency situations.

Power Marketing Advisor Bob Langenberger

I am looking forward to being a part of the inaugural ICG and developing strategies for WAPA to more effectively communicate throughout the organization. It will be a great opportunity to meet new people and establish new relationships across WAPA.

Supervisory Auditor Greg Loendorf

I am excited to have the opportunity to help improve and enhance communication and collaboration across the organization. I am also looking forward to meeting new people and contributing to this team. It's great to see WAPA's commitment and leadership in this area.

Electrical Engineer Lori Messegee

"Listen to understand. Speak with purpose." It's one of our core values for good reason. I believe improved communications lead to increased efficiency and elevated morale. This is an exciting opportunity for me to serve WAPA in this endeavor.

Financial Program Analyst Lisa O'Brien

I'm looking forward to the opportunity to work with the ICG to improve the way information is exchanged in an effort to evolve our communication strategy. I'm also excited for the chance to meet and cultivate new relationships with employees from a variety of functional areas and locations.

Vice President of Reliability and Compliance Brent Sessions

I am excited about participating in the ICG because I have some specific ideas I want to develop and implement. This group provides an opportunity to accomplish that. Consistent and timely communication helps solve many problems before they begin as well as helps employees understand what is going on around the organization. In the end, it saves time and aggravation.

Contract Specialist Diana Weiss

Communication has always been a passion of mine. The ICG will enable me to stretch into different areas of WAPA to learn about the cultures and various communication patterns already present. I look forward to taking the skills and innovative ideas I have to the team to make improvements to our communication and culture.

Transmission Scheduling Supervisor Ira Witherspoon

Working for WAPA for the past 16 years, I have been fortunate to be part of many projects and initiatives. In order to better align WAPA's most valuable resource—its people—I look forward to blending my knowledge and experience with the larger ICG. I am honored to be a part of it.

Phase One of EMMO job task analysis complete

The Upper Great Plains Energy Management and Marketing Office team has completed the first phase of an in-depth job task analysis project. The team has identified and created job aids and on-the-job training guides for more than 100 tasks. This project has taken six months to complete.

“This fosters a ready and resilient team environment where employees have increased confidence and job satisfaction.”

“This project was a first of its kind to my knowledge within WAPA,” said Supervisory Energy Management and Marketing Specialist **Neil Lindgren**. “This effort ensures consistency of performance within our group, while ensuring the next generation of employees has a higher level of understanding in a shorter timeframe, allowing them to learn from our experience and knowledge from a boarder spectrum of documentation.”

In line with *Strategic Roadmap 2024*’s critical pathway of Business, Technology and Organizational Excellence, the UGP EMMO workgroup has taken innovative steps to modernize knowledge sharing.

The EMMO group established a standard format for documenting the group’s collective knowledge. Through a six-month process, the group is now using an electronic database to document and share job knowledge.

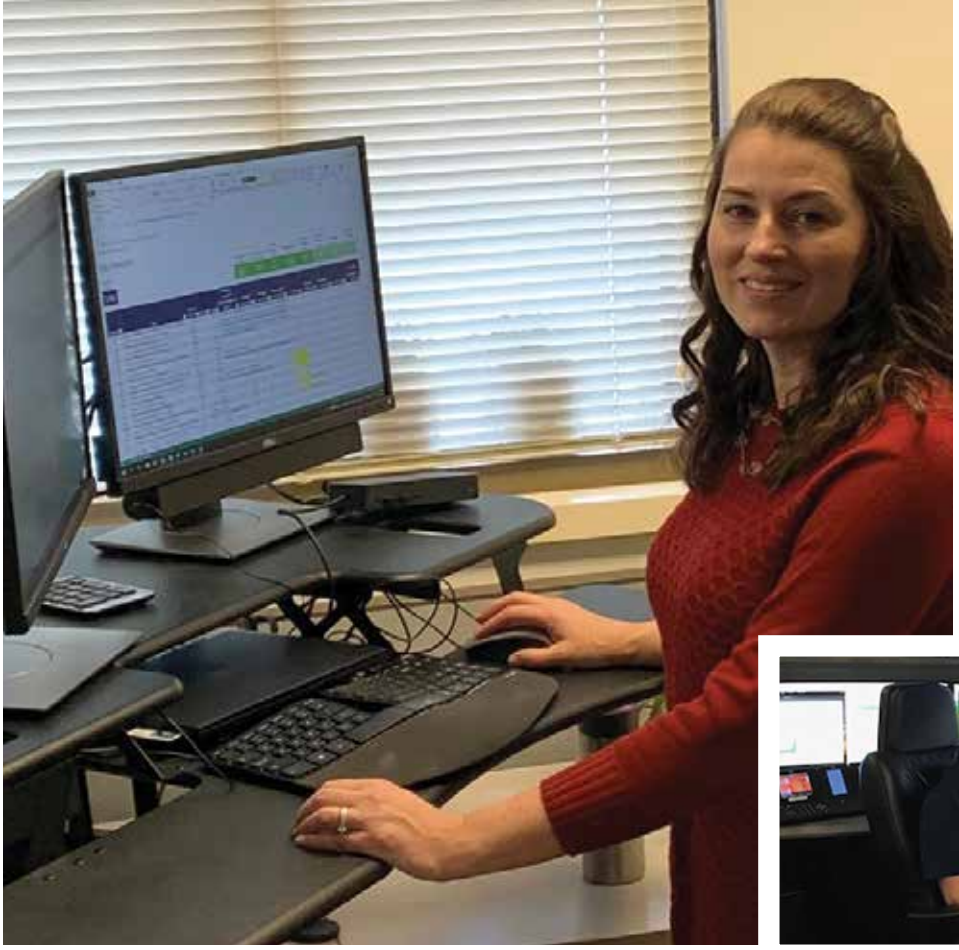
“The JTA project utilized an off-the-shelf electronic database to organize the Upper Great Plains EMMO tasks into an easy-to-use format,” said Energy Management and Marketing Specialist **Brent Garvey**. “This software and effort will facilitate a better training process for new hires while documenting key areas of knowledge from our merchant staff.”

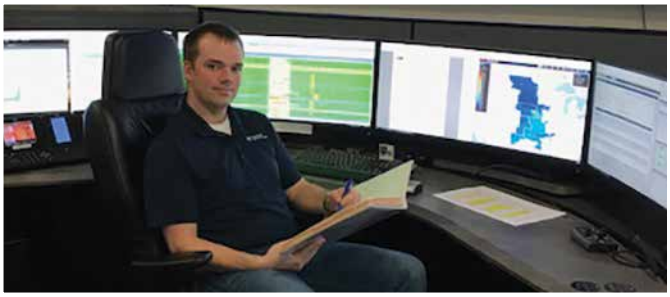
The training software package is geared for the electric utility industry. The software is currently being used for storing on-the-job training—or OJT—guides for knowledge-sharing and knowledge-retention efforts.

The OJT guides create a knowledge base that is available 24/7 and will increase productivity and reduce uncertainties when performing tasks. The job aids and OJT guides provide a structured approach for new-hire onboarding. Having all OJT guides in one easily navigable location accelerates employee training efforts and assists in covering for employees on leave.

“To support employees in an ever-changing work environment, it is imperative that all tasks are identified and mapped out,” said Public Utilities Specialist **Judy Shimek**. “As energy markets change, job processes can be wisely planned and communicated in advance. This fosters a ready and resilient team environment where employees have increased confidence and job satisfaction.”

For future efforts, the software package is designed for expansion beyond the OJT guides to develop employee





Energy Management and Marketing Specialist *Brent Garvey* and Public Utilities Specialist *Judy Shimek* were two of the Energy Marketing and Management Office employees who created job aids and on-the-job training guides to enhance information sharing and knowledge retention.

training programs, succession planning and performance evaluations.

"The job task analysis project has been a teamwide effort to document key processes and work practices in our area to ensure knowledge retention for a dynamic work group," said Garvey.

Many of the documented tasks had only one EMMO employee with the knowledge to complete them. These tasks can now be completed by others using the step-by-step job aids, which will be especially helpful in the case of emergency.

This project recognizes the vast skill sets the EMMO team has built over time and through extensive training and work experiences. Team members are valued for their diverse job knowledge and willingness to learn new skills.

The OJT guides produced by the application database are filed to the EMMO SharePoint team site. These files can be searched and accessed WAPA-wide. Now, when the EMMO team receives inquiries about processes, the OJT guides are readily available and easily forwarded.

"This project is applicable WAPA-wide for business areas," explained Shimek. "WAPA could use this project to demonstrate the value and importance of knowledge retention."

The OJT guides also provide the standards for communications and have been helpful in instances of communication breakdown.

"This effort has been an 'all-hands-on-deck' project," Shimek said. "This process had broadened communication paths and found agreement on performance standards for each task. Each EMMO team member has made significant contributions to the knowledge database. Through the extensive review process, even seasoned marketers have adopted and learned new ways of completing tasks."

"This highlights the group's ability to try new things, trusting that the work of documentation of their work practices and knowledge, as well as building the job aids, would benefit the next generation of EMMO staff," said Lindgren. "It ensures we're not only able to provide excellent customer service today, but also into the future."

"I believe the UGP EMMO job task analysis effort will be one that can be duplicated across WAPA, serving as an example of how to effectively facilitate knowledge retention in all areas of the business," concluded Garvey. □

This project:

- Increases effectiveness of new-employee training while reducing training time and associated costs.
- Reduces redundancy or outdated materials in multiple folders.
- Increases employee consistency and reliability of work performance.
- Increases adaptability to changing market conditions.
- Identifies the knowledge and skill sets that must be recruited and retained for the EMMO group to be successful.
- Establishes an unbiased case for succession planning and management decisions and work group support.
- Documents standards for communication and performance of tasks.
- Enables relief shifts and new employees in performing tasks they may not have performed before.
- Improves processes and broadens communication paths for optimal performance.
- Is the right thing to do.

Archaeologists hit the pottery lottery

Story by Leah Wilson
Photos by Natalie Ortega and Christina Rogers

On Feb. 21, Archaeologists **Natalie Ortega** and **Christina Rogers** discovered some amazing artifacts while performing field work in Desert Southwest along the Coolidge-to-Oracle transmission line in Arizona. The findings happened in the late morning and consisted of various pieces of Hohokam pottery.

The archaeological cultures of the Southwest traded and coexisted.

Process of discovery

Part of Ortega's and Rogers' job is to manage the cultural resources that are within WAPA's jurisdiction.

"When a project is about to happen, it is our job to look at that project and determine if it will have an effect on any cultural resources within its boundaries as well as outside, to an extent," Ortega said.

They also consult various agencies about the project and get their perspectives before giving recommendations to management. Before that consultation happens, they must get a better idea of what the resources are and what the sites look like on the ground.

"The environment is constantly changing and what we thought we knew about the site two years ago might be completely different from today," Ortega said. "This often requires Nina and me going into the field to get an in-person assessment so we can better understand the project's effects."

On that particular Friday, the project required just that. The archeologists' site visit led to a remarkable find: pottery from the Hohokam society, including a Gila plainware pot.

The pot is black and white on the outside, and the inside is painted red, making it a Salado polychrome potsherd. This means it has three colors, as opposed to a black-and-white, two-color sherd. It dates to the Classic Hohokam period, between 1275 and 1450.

They also found other sherds, including a body sherd that was colored black from either fire-clouding or from being painted. This piece could date anywhere from 800 to 1450.

Classic Hohokam period

The Hohokam were prehistoric people who inhabited the Sonoran desert, including Arizona, along the Salt and Gila Rivers. The estimated timing of their existence spanned 300 to 1400. The Hohokam were one of several advanced cultures during that period.

The Hohokam inhabited a small area around what are now Phoenix and Tucson. They coexisted with other societies and cultures throughout the Southwest, with trade happening regularly between them.

Years of experience

"Nina and I have different archaeological specialties," said Ortega, "which comes in handy because we 'manage' a variety of archaeological sites."

The archeologists' specialties stem from years of undergraduate and graduate studies as well as working with various cultural resources and experience. They have built relationships with Native American tribes and have kept a willingness to learn and

What else happened between AD 800 and AD 1450?

Well, lots of things, obviously. Here are a few for context. Most dates are approximate.

800	841	885	919	1001	1024	1041
Charlemagne is crowned emperor of Rome by Pope Leo III.	Dublin is founded on the east coast of Ireland by the Vikings.	The Cyrillic alphabet is developed.	The first use of gunpowder in battle occurs with the Chinese Battle of Langshan Jiang.	Vikings, led by Leif Eriksson, establish settlements in North America.	The world's first paper-printed money appears in China.	Moveable type is developed by Chinese artisan Bi Sheng.

This Gila plainware pot can be dated between 800-1450. This view is from the outside of the pot.

The opposite side of this black and white potsherd is red, making it a Salado polychrome potsherd. It is from the rim of a jar dating to 1275-1450.

remain open-minded toward different cultures.

Rogers specializes in Native American pottery while Ortega's focus is in historical archaeology including cans, bottles and ceramics.

"When I find an artifact I always get a rush of emotions," Ortega said. "My mind immediately tries to recreate what the complete artifact might have looked like or what the environment around me might have been like when the artifact was being made. For me, it's a way to connect with the past and the idea that we are all in some way connected."

Archaeology helps us comprehend how humans progressed and cultures developed.

"It is important that WAPA continues to preserve that heritage and build relationships with our consulting parties in order to meet everyone's needs," she emphasized.

It belongs in a museum!

There are many federal laws that protect cultural resources in America as well as internationally; it is imperative that employees and their families know to leave artifacts alone if found while they are exploring.

Taking pictures and looking at them are allowed, but excessive handling is not recommended due to the fragile nature of some of the artifacts. Additionally, collecting or looting artifacts is prohibited and a violation of the Archaeological Resources Protection Act, which can include a $10,000 fine and up to one year in prison.

If archaeological or historical materials are discovered, contact WAPA's archaeologists or the federal agency that has jurisdiction over the land you are on. □

Note: Wilson is an administrative analyst who works under the Wyandotte Services contract.

Definitions

Archaeologist: one who studies human history and prehistory through the documentation of sites and the analysis of artifacts and other physical remains.

Sherd: a broken piece of ceramic material, especially one found on an archaeological site. Common abbreviation for "potsherd."

1057	1071	1185	1280	1347	1431	1480
Macbeth, king of Scotland, dies in battle against future king Malcolm III.	The Oxford Castle in England is built.	The earliest known windmills are constructed.	Eyeglasses are invented in Venice, Italy.	The Black Death begins, ultimately killing around a third of Europe's population.	Nineteen-year-old Joan of Arc is burned at the stake for heresy. She would be acquitted in 1456.	The Spanish Inquisition begins, with the first a*uto-da-fé* held the following year.

Students get hands-on experience at EPTC

Photos by Leah Wilson

On Feb. 21, a group of around 20 ninth-grade students from John F. Kennedy High School in Denver, Colorado, visited WAPA's Electric Power Training Center in Golden for a packed day of discussions, demonstrations and hands-on exercises.

Electric Power Training Center Manager *Kyle Conroy* explains the Miniature Power System ahead of hands-on exercises.

The event was organized and facilitated by the center's staff, led by EPTC Manager **Kyle Conroy**.

This was not the first student visit Conroy led in his time with the EPTC; in fact, he sees these visits as an important service in aid of science, technology, engineering and mathematics—or STEM—education.

"The reason we continue to provide these STEM-related opportunities to middle- and high-school students is because it is exciting to engage with these young minds and hopefully give them some insight into the opportunities in our industry," he said.

As the day would prove, his hopes came true.

Relaying knowledge

Conroy has 39 years of industry experience; he started his career as a lineman and has spent around 15 of those years with WAPA. He became EPTC manager in 2017.

With so much knowledge and experience to share, Conroy made sure his demonstrations would be engaging to a young audience. He activated a traveling-arc device informally known as a Jacob's ladder and a Van de Graaff generator—two devices the students had likely already seen in science-fiction films—to show them just a few of the ways to observe and understand electricity.

He also used an impressive, functional cutaway model of a hydroelectric powerplant to demonstrate how that electricity can be produced.

Conroy discussed many things in his overview, including a brief history of the power marketing administrations, the introduction of hydroelectric power in the West in the early 1900s, the purpose of the Department of Energy and, of course, WAPA's role in transmitting clean, affordable, reliable hydroelectric power to more than 40 million Americans.

He also taught the students about a number of considerations when it comes to generating, transmitting and using power. He discussed everything from the difference between AC and DC to why some materials—such as copper—are better conductors than others.

Many in the class were surprised to learn just how much happens behind the simple act of turning on the lights or plugging in their phones for charging.

Two students in particular found the lesson intriguing.

Jackseny Roldan, who has an interest in marine biology, didn't think electricity was as complicated as it is. "Now I'm going to be thinking about how much is involved when it comes to using the computer or TV," she said. She found the concept of power transmission especially fascinating.

Alexandra Ronquillo, who plans to study medicine and law, surprisingly had the opposite reaction, though she was no less intrigued. "It was actually simpler than I expected," she said. This is because she was already taking a structural view of energy distribution. "I had an idea of the ways electricity got from a powerplant to a house. I didn't know the specifics, but now I know it's pretty simple and makes a lot of sense."

Roldan and Ronquillo enjoyed the lesson so much they volunteered

Right: Students participated in a series of simulated grid issues and disruptions on the Miniature Power System.

Left: Students who were not actively participating in the simulation stayed engaged by observing and monitoring the progress made by their peers.

to be the first students to simulate transmitting energy and responding to problems using the EPTC's Miniature Power System.

Learning by doing

The centerpiece of the visit was the simulation exercises on the MPS. Conroy and Electrical Engineer **Joseph Liberatore** gave the students an extensive tour of the system and explained how it uses actual power on a small scale to simulate the management of the real-life grid. They also previewed a few upgrades to the MPS that will be making their official debut later in the year.

After the introduction to the MPS, Conroy invited students to participate in a series of simulated grid issues and disruptions.

One of the primary things Conroy communicated during the morning's presentations was the importance of constant communication. "Communication saves lives," he emphasized, and this was a precept the students definitely put into practice during the simulations; even those who were not actively participating at the time called advice and suggestions to their friends.

"It was awesome to see many of the children interested in what we do here at the EPTC and WAPA," said Administrative Analyst **Leah Wilson**, who works under the Wyandotte Services contract. Wilson noted that this particular group was among the most engaged she had seen. "I think that showed they were interested in all aspects of the EPTC and that they are starting to think about their future endeavors. They were engaged and excited to take on the MPS demos and learn more about electricity."

One of the most engaged students was Christian Clement, who was particularly interested in how system operators keep the power flowing. "It looks intimidating and complicated," he said, "but now that it was explained, I get it."

An aptitude for power delivery runs in Clement's family; his father and grandfather were both linemen. Clement even joined his father on several trips to watch him work. For this particular student, it was an opportunity to see what an actual career in the industry might be like.

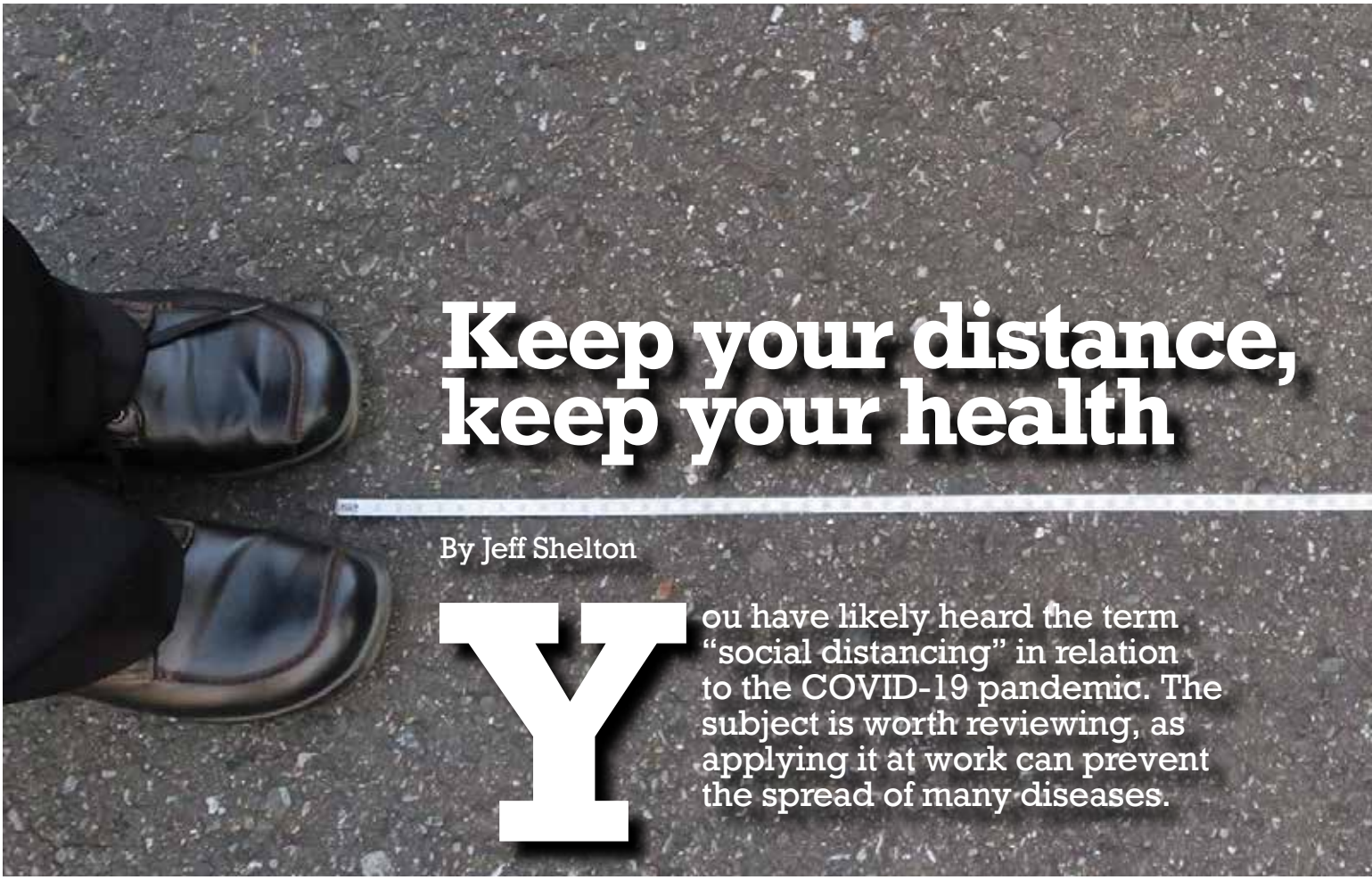
"Ever since I was little I wanted to be an electrical engineer," Clement said. "I'm glad I got to come."

He was far from the only one who ended the day considering career opportunities.

"Usually, the students who attend solely ask the instructors about their jobs, how much they make, what they do," said Wilson, "but some were even asking me specifically about my job as an administrative analyst here at the EPTC. I think it's important to host events like these because it shows future generations the vast possibilities and job opportunities in our industry."

Conroy handed out certificates to the students, a reminder of the day's activities and the opportunities they represent.

"For me, it's more than just those that might be college bound," said Conroy. "It's about including career opportunities in the crafts, operations and other support personnel necessary for an electrical utility to operate." □



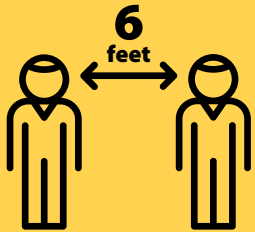
Keep your distance, keep your health

By Jeff Shelton

You have likely heard the term "social distancing" in relation to the COVID-19 pandemic. The subject is worth reviewing, as applying it at work can prevent the spread of many diseases.

Social distancing works in one or more of the following ways:

- Increasing the average distance between people.
- Reducing the size of face-to-face groups.
- Minimizing the time people spend together.



Social distancing refers to any measure intended to slow the spread of a disease by reducing human-to-human interactions that can spread infection. It is a supplement to, but does not replace, traditional infection-control measures such as handwashing and surface disinfection.

Increasing the average distance between employees helps, because many diseases spread through exposure to respiratory droplets expelled when an infected person coughs or sneezes. You can also be indirectly exposed by touching surfaces that have been contaminated.

It is important to remember that in many cases, including COVID-19, people may become infectious before they show any symptoms. Therefore, not only employees who are themselves ill, but those who have been exposed to sick family members could be incubating the disease. This is why many Americans, other than those who cannot fulfill mission-critical functions remotely, are currently working from home.

A pandemic will affect more than work. Conferences, sporting events and concerts will be cancelled or postponed. Theaters and restaurants may close. Schools will be affected. Takeout and grocery delivery will take the place of restaurant reservations and shopping trips. Employees who are parents will have to deal with extended school closures, and this is likely to add to workplace staffing challenges.

For work that is impossible to perform remotely, it is possible to rearrange a workspace to increase the distance between employees.

Teleconferencing and virtual meetings are being held across the country even for local office meetings to maintain a safe distance between workers. If workgroups absolutely must meet physically, meeting in an open area and standing several feet apart is more protective than sitting around a conference table. Any essential face-to-face meetings should be kept as brief as possible.

Minimizing the size of any face-to-face groups both reduces the chance of the group containing an infected employee and reduces the number of people who could be exposed to that employee. Staggering work shifts may offer a way to reduce the number of employees in proximity at any one time.

Additionally, limit travel as much as possible. Airline travel is likely to expose you to large numbers of potentially infected people. Non-essential travel should be postponed for the duration of a pandemic emergency. For mission-essential travel, personal or government-owned vehicle travel, if feasible, may expose the traveler to fewer potentially infective contacts than air travel.

It is important to recognize that it is all about limiting exposure and protecting ourselves and others. The more we can limit exposure, the quicker we can slow the spread of any virus. □

Note: Shelton is an industrial hygienist. Information in this article is adapted from that provided by the Centers for Disease Control and the World Health Organization.

“Teleworking, taking leave or staying at home is a highly effective form of social distancing.”

Asset Management: Harnessing data to manage risk

By Kevon Storie

As Asset Management enters its fifth year as a formal program in 2020, it continues to expand its scope and demonstrate the critical role data plays in managing risk.

New year, new assets

The year began with the addition of four new assets to the program: load tap changers, bushings, power circuit breakers under 100 kilovolts and cranes, the program's first asset in the heavy fleet class.

These assets were chosen because of their potential to affect WAPA's ability to deliver power to its customers. Power circuit breakers of 34.5 kV and 69 kV represent a large portion of WAPA's fleet and, in many cases, are critical to directly serving customer load. Load tap changers and bushings may seem less critical, but failure of these components can take out larger, more complex, more critical and more expensive assets such as breakers and large power transformers.

Cranes, while not involved in transmission, are necessary for performing many types of routine and emergency maintenance and repairs. Maintaining and replacing these asset classes consume considerable time, labor and dollars so applying the asset management approach to them will yield significant benefits for WAPA's maintenance community.

Cracking problem codes

AM data can give stakeholders inside and outside of WAPA the big picture of asset performance—as long as they have a shared understanding of what the data represents. In 2020, WAPA will update its data-collection methodology that standardizes descriptions of in-service asset anomalies. This effort will improve equipment performance analysis, consistently communicate asset data within WAPA and facilitate knowledge sharing with the utility industry.

The practice of using a standard set of terminology to describe field-observed equipment problems is called problem code reporting. When maintenance personnel are documenting the work they performed, they select a term from a hierarchy to indicate the condition of the equipment components that require work. Describing problems with a set of standardized terms, rather than a non-standard text description, enables efficient analysis of the causes of equipment problems.

WAPA's reliability-centered maintenance program has long used problem code reporting in one form or another to collect in-service asset data. The project to improve WAPA's current coding system stemmed from the need to create enough codes to accurately describe conditions, but not so many that users become bogged down trying to determine which code applies to the situation.

AM collaborated with fellow member utilities of the North American Transmission Forum to develop the new problem code system, which focuses on substation assets. The system correlates specific types of equipment component problems to codes vetted and agreed upon by industry partners who own and operate similar types of equipment. This "common language" will aid WAPA and other utilities in identifying asset performance trends and mitigating potential risks.

Spreading the data

Being able to turn data into accessible, user-friendly reports is another critical component to the success of an asset management program. Asset data is only useful in mitigating risk when offices and departments throughout an organization are able to easily understand and apply the analyses to their functional areas.

Asset reports are usually produced in spreadsheets and other tabular-type data, which is not conducive to easy interpretation by end users. AM will continue to explore tools to produce better visual data in 2020. Expanding the use of WAPA's graphical information system and leveraging other reporting systems will help to increase the use of AM data beyond its current audience.

In the utility industry, effective risk management means looking beyond one organization's assets to collaborate, share data and seek proactive solutions to evolving threats. As the AM program matures, it will continue to provide WAPA and its customers with data and analysis that supports a robust and secure grid delivering reliable, affordable power. □

Note: Storie is a technical writer who works under the Wyandotte Services contract.

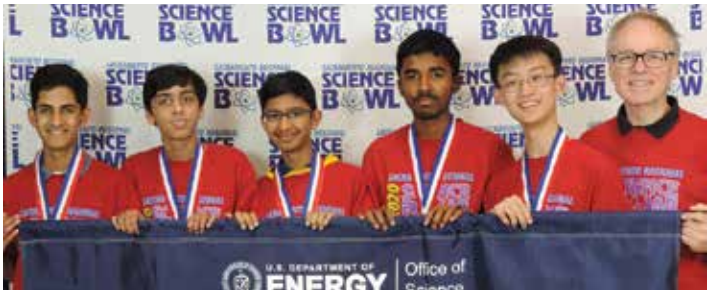
2020 regional Science Bowls announce winners

WAPA is proud to have sponsored six regional Science Bowls in 2020. Below are the winners of those events. Each advances to the National Science Bowl in Washington, D.C.

Colorado Regional Middle School Science Bowl

Preston Middle School

Coach Logan Burke, Logan Bowers, Quentin Perez-Wahl, Colin Magelky, Jackson Dryg, Kary Fang



Sacramento Regional High School Science Bowl

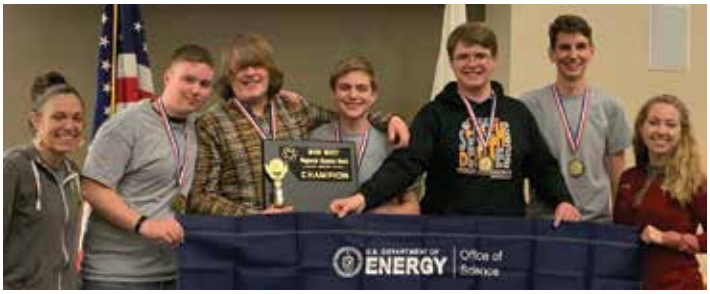
Mira Loma High School

Vishwa Akkati, Rohan Shelke, Nipun Dour, Achyuta Ramesh, Albert Qin, Coach James Hill

North Dakota Regional High School Science Bowl

Bismarck Century High School

Srikrishna Kandooru, Jacob Lundstrom, Leah Bandy, Alexander Heiser, Sean Brynjolfon



Big Sky Regional High School Science Bowl

Helena High School

Coach Kristin Berry, Greysen Smith, Jonathan DeWald, Heath Caldwell, Tim Cuddy, Owen Cleary, Coach Emily Gillin

South Dakota Regional High School Science Bowl

Rapid City Central High School

Coach Sam Steinken, Garrett Warbis, Alex Heindel, Mason Harvison, Sevyn Leombruno, Kaden Kelderman

Big Sky Regional Middle School Science Bowl

North Middle School

Anthony Rangel, Audrey Davidson, Brandt Barnwell, Alex Young, Jack Salzman, Coach Mary Somerfeld

How would you fare in the National Science Bowl?

Test your knowledge with the following official sample questions from the National Science Bowl. How many can you get right? Check your answers on the back cover.

Middle school questions

1) Approximately what fraction of Earth's surface is covered by oceans?
a) one-half
b) two-thirds
c) seven-tenths
d) four-fifths

2) If there are 640 ounces of water in 5 gallons, how many ounces are in 1/2 gallon?

3) Which of the following fossils is the oldest?
a) trilobite
b) snake
c) petrified wood
d) megalodon tooth

4) Find the volume, in inches cubed, of a rectangular solid whose dimensions are 3-inches by 5-inches by 8-inches.

5) Minuends and subtrahends are used in which of the following mathematical operations?
a) addition
b) subtraction
c) multiplication
d) division

6) From what biological polymer is paper primarily composed?

7) What is the mass, in grams to the nearest whole number, of one cubic centimeter of pure water at standard temperature and pressure?

8) The best evidence for the model of Earth's interior comes from the study of:
a) seismology
b) paleontology
c) paleomagnetism
d) glaciology

9) What terrestrial planet rotates in an opposite direction to the planet Earth?

10) If the angle of incidence for a beam of light on a mirror is 27 degrees, what is the angle of reflection, in degrees?

11) On the earth's surface, which of the following is closest to the mass of 1,000 pounds?
a) 454 kilograms
b) 2,200 kilograms
c) 1 ton
d) 1 kiloton

12) What is the average acceleration, in kilometers per hour per second to the first decimal place, of a bird flying in a straight path from 0 to 50 kilometers per hour in 4 minutes and 10.0 seconds?

13) Which of the following would be used on a weather map to indicate a cold day in winter with clear, blue skies?
a) capital L
b) capital H
c) green shaded areas
d) pink shaded areas

14) Which of the following must be TRUE for a tree that doubled its mass over a growing period of 2 years?
a) it has doubled its volume
b) it has doubled its number of atoms
c) it has doubled its inertia
d) it has doubled its density

15) The transfer of energy from the Sun across space is accomplished primarily by:
a) conduction
b) convection
c) radiation
d) radio waves

High school questions

1) Find the mass of 1 mole of cuprous oxide, or Cu_2O. Assume the atomic mass of copper is 64 and oxygen is 16.

2) How many significant figures are in the number 0.00750?

3) How many embryonic seed leaves does a bean seedling have?

4) Giving your answer in terms of π and in inches, what is the arc-length of a semi-circle whose diameter is 18 inches?

5) Mary and Joe are on a merry-go-round. Mary is seated near the center of rotation and Joe is on the outer edge. Which of the following best describes their motion?
a) Mary has a greater acceleration than Joe
b) Joe has a greater acceleration than Mary
c) neither Mary nor Joe are accelerating
d) both Mary and Joe have the same acceleration

6) How many grams of sodium chloride is in 2,000 milliliters of 0.9% NaCl solution?

7) The temperature of a star can be estimated most directly from its:
a) distance
b) elemental makeup
c) color
d) density

8) If the speed of sound in a certain medium is 360 meters per second, what is the wavelength, in meters, of a sound-wave that has a frequency of 60 hertz?

9) What is the common name for the product of human lachrymal glands?

10) Bioluminescence is a phenomenon most common in which of the following environments?
a) marine
b) fresh water
c) land
d) atmosphere

11) In which of the following areas of the human body is the zygomatic arch found?
a) shoulder
b) pelvis
c) head
d) knee

12) What is the most common color for the calyx of angiosperms?

13) Although scientists are unable to obtain samples by drilling, they believe the predominant mineral in the mantle is:
a) iron pyrite
b) potassium feldspar
c) quartz
d) olivine

14) What is the most accurate term for predicting values of data that are located between known data points on a line graph?
a) extrapolation
b) extension
c) interpolation
d) cheating

15) Although you might expect this planet to be visible to the unaided eye because of its maximum apparent magnitude value of about +5.8, what planet is unlikely to be seen by most stargazers since it requires nearly ideal viewing conditions?

ITSLT members remain students of the business

Photos by Leah Shapiro

The Information Technology Senior Leadership Team held a face-to-face meeting Feb. 25-27 at The Spillway House at Hoover Dam in Boulder City, Nevada.

At the meeting, the team discussed WAPA's Cloud strategy, workload management tools and workforce planning for the Office of the Chief Information Officer. While there, the ITSLT took a tour of Hoover Dam, led by Bureau of Reclamation Hoover Dam Manager Mark Cook.

Foreman II Electrician **Randy Strand** hosted the group for a tour of Mead Substation. The ITSLT also had the opportunity to meet with the Desert Southwest Regional Executive Team, which was meeting in Henderson to learn about issues affecting their respective lines of business, both now and on the horizon, and identify opportunities to leverage technology solutions.

Answers to the National Science Bowl quiz on Page 11

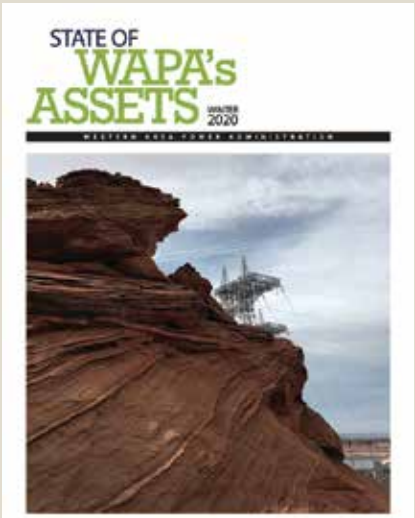
Middle school

1) c, seven-tenths
2) 64
3) a, triiodite
4) 120
5) b, subtraction
6) cellulose
7) 1
8) a, seismology
9) Venus
10) 27
11) a, 454 kilograms
12) 0.2
13) b, capital H
14) it has doubled its inertia
15) radiation

High school

1) 144
2) 3
3) 2
4) 9π
5) b, Joe has a greater acceleration than Mary
6) 18
7) c, color
8) 6
9) tears
10) a, marine
11) c, head
12) green
13) d, olivine
14) c, interpolation
15) Uranus

State of WAPA's Assets now available



The 2020 State of WAPA's Assets is now available. The report discusses the organization's operations, transmission system and related services.

Inside, customers will find updates on the status of each region, an overview of 2019's hydrology conditions and progress on current initiatives.

Read the State of WAPA's Assets at **wapa.gov, Newsroom, Publications, Customer Circuit**

Energy Services offers educational resources

WAPA's Energy Services program offers educational services through its Resources page. The information available here can be helpful to the public, students and others.

The resources on this page range from information targeted at school children from grades K-12 to technical training for adult visitors.

Be sure to bookmark the page and explore the resources available.

Visit the Energy Services Energy Education page at **wapa.gov, Energy Services, Resources, Energy Education**

COVID-19 updates available

The latest updates and guidance regarding coronavirus or COVID-19 are available on *my*WAPA. The organization will continue to communicate updates regularly, but this dedicated page will serve as a single-stop destination for employees to review and familiarize themselves with all updates.

Visit ***my*WAPA, Departments, Security and Emergency Management, COVID-19 updates**

Correction

On Page 15 of the March issue of *Closed Circuit*, the order referencing administrative controls should have been identified as "WAPA Order 440.1B – Occupational Safety and Health Program." The *Closed Circuit* editor apologizes for the error.